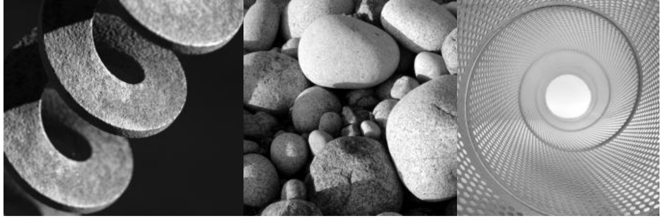

GEI Consultants

Geotechnical
Environmental
Water Resources
Ecological

DRAFT

Specific Site Assessment for Coal Combustion Waste Impoundments at Empire District Electric Company Asbury Power Station

Asbury, Missouri

Submitted to:
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Office of Resource Conservation and Recovery
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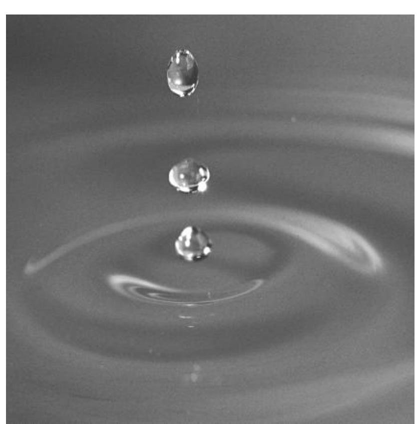

Brian S. Johnson, P.E.
Senior Project Engineer

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Acronym List

CCW	coal combustion waste
CMP	corrugated metal pipe
EPA	U.S. Environmental Protection Agency
FEMA	Federal Emergency Management Agency
GEI	GEI Consultants, Inc.
IDF	inflow design flood
APS	Asbury Power Station
MW	megawatts
MDNR	Missouri Department of Natural Resources
PMF	probable maximum flood
PMP	probable maximum precipitation
USACE	U.S. Army Corps of Engineers
USBR	U.S. Bureau of Reclamation
USGS	U.S. Geological Survey

1.0 Introduction

1.1 Purpose

This report presents the results of a specific site assessment of the dam safety of coal combustion waste (CCW) impoundments at the Asbury Power Station (APS) in Asbury, Missouri. The Asbury Power Station is operated and owned by Empire District Electric Company (Empire District). The impoundments are the Upper Pond, Lower Pond and South Pond. The specific site assessment was performed on November 4, 2010.

The specific site assessment was performed with reference to Federal Emergency Management Agency (FEMA) guidelines for dam safety, which includes other federal agency guidelines and regulations (such as U.S. Army Corps of Engineers [USACE] and U.S. Bureau of Reclamation [USBR]) for specific issues, and includes defaults to state requirements where not specifically addressed by federal guidance or if the state requirements are more stringent.

1.2 Scope of Work

The scope of work between GEI Consultants, Inc. (GEI) and the U.S. Environmental Protection Agency (EPA) for the specific site assessment is summarized in the following tasks:

1. Acquire and review existing reports and drawings relating to the safety of the project provided by the EPA and Empire District.

2. Conduct detailed physical inspections of the project facilities. Document observed conditions on Field Assessment Check Lists provided by EPA for each management unit being assessed.

3. Review and evaluate stability analyses of the project's coal combustion waste impoundment structures.

4. Review the appropriateness of the inflow design flood (IDF), and adequacy of ability to store or safely pass the inflow design flood, provision for any spillways, including considering the hazard potential in light of conditions observed during the inspections or to the downstream channel.

5. Review existing dam safety performance monitoring programs and recommend additional monitoring, if required.

6. Review existing geologic assessments for the projects.

7. Submit draft and final reports.

1.3 Authorization

GEI performed the coal combustion waste impoundment assessment as a contractor to the EPA. This work was authorized by EPA under Contract No. EP09W001698, Order No. EP-B10S-00018 between EPA and GEI, dated September 23, 2010.

1.4 Project Personnel

The scope of work for this task order was completed by the following personnel from GEI:

Brian S. Johnson, P.E.	Senior Project Engineer/Task Leader
Stephen G. Brown, P.E.	Project Manager
James E. Wright, P.G.	Project Geologist
Nick Miller, P.E.	Project Water Resources Engineer

The Program Manager for the EPA was Stephen Hoffman.

1.5 Limitation of Liability

This report summarizes the assessment of dam safety of coal combustion waste impoundments Upper Pond, Lower Pond and South Pond at Asbury Power Station, Asbury, Missouri. The purpose of each assessment is to evaluate the structural integrity of the impoundments and provide summaries and recommendations based on the available information and on engineering judgment. GEI used a professional standard of practice to review, analyze, and apply pertinent data. No warrantees, express or implied, are provided by GEI. Reuse of this report for any other purpose, in part or in whole, is at the sole risk of the user.

1.6 Project Datum

The project datum was not identified on the documents reviewed by the assessment team.

1.7 Prior Inspections

The last inspection conducted at the facility was by the Missouri Department of Natural Resources (MDNR). The inspection focused on the cooling water, storm water, and wastewater facilities operating under Missouri State Operating Permit MO-0095362. MDNR inspections are intended to assess the environmental conditions of the CCW impoundments and not to assess conditions from a dam safety perspective. No third party inspections of the impoundments have been performed and the MDNR has not announced the current inspection schedule. A visual inspection of the CCW impoundments is performed at least once per 12-hour shift by an Empire District employee.

2.0 Description of Project Facilities

2.1 General

Asbury Power Station is a coal-fired, cyclone type, power plant consisting of two units with a combined generating capacity of about 232 megawatts (MW). The power plant is located approximately 7 miles northeast of the town of Asbury, in Jasper County, Missouri (see Figure 1). Both generating units are owned and operated by Empire District. Unit 1, with a generating capacity of 213 MW, went online in 1970 and Unit 2, with a generating capacity of 19 MW, went online in 1986. The CCW impoundments are located east and southeast of the power plant. The CCW impoundments include the Upper Pond, the Lower Pond and the South Pond, which operate under a State of Missouri permit to store fly ash and boiler slag. The CCW byproducts generated at APS are sluiced through pipes to the Lower Pond where the solids drop out of the slurry and are collected either for commercial sale or diverted further into the Lower Pond impoundment. The sluice water is decanted to an open-water portion of the Lower Pond and then pumped to the Upper Pond where it is decanted once more into the South Pond and eventually reused as make-up water for the plant. There is an overflow spillway in the crest of the Lower Pond embankment that is adjacent to a 12-inch diameter outlet valve and pipe. Flows from the outlet pipe can be measured by a V-notch weir at the pipe outlet. The overflow spillway and outlet pipe are used for controlled releases regulated by the Missouri Department of Natural Resources (MDNR), Pollution Control Branch. The APS is 7 miles from Spring River, the nearest major perennial waterway. The operating water supply originates from onsite water wells that are used to fill a cooling water reservoir south of the plant. There were no design records or “as-built” drawings of the CCW impoundments to review during the preparation of this report. The exact commissioning dates of the impoundments are unknown. The Upper Pond was constructed in 1970, the Lower Pond was constructed in 1974 and the South Pond was added in 1978.

2.2 Impoundment Dams and Reservoirs

The embankment dams of the three CCW impoundments have not been previously assigned a hazard potential classification by a state or federal agency. Based on the configuration of the impoundments and the facilities downstream, recommended hazard potential classifications for the impoundments have been developed in Section 4.0 of this report. The basic dimensions and geometry of the CCW impoundments are summarized in Table 2.1.

The Lower Pond is used to settle and store solids from the fly ash and boiler slag CCW and decant the sluice water for plant reuse. The pond surface area is approximately 63 acres. The original pond depth varied from 0 to about 10 feet; however, deposition of CCW from the power plant over time has reduced the pond depth to a maximum of about 5 feet. The impoundment is constructed on a side-hill site and has a perimeter embankment on three sides totaling approximately 5,400 linear feet. The perimeter embankment ranges in height from 1 foot to 15.5 feet with a varying crest width of 10 to 20 feet. The downstream embankment slopes are approximately 2 horizontal to 1 vertical (2H:1V) above a constructed bench at mid-slope and 1H:1V below the bench.

In 1987, the Empire District contracted with Black and Veatch Engineers – Architects of Kansas City for an Ash Pond Improvement Study at the Asbury Power Station. Based on the results of a site investigation that included test pits and laboratory testing, Black and Veatch designed an impermeable clay barrier for the Lower Pond that was excavated and “keyed” into the underlying clay downstream of the existing crest. The clay barrier was constructed along the north, east and south perimeter embankments of the Lower Pond.

Surface drainage collects generally along or near the downstream toe of the embankment, and flows to the southeast corner of the Lower Pond. A relatively well-defined channel (“north ditch”) runs along the downstream toe of the north embankment, and discharges into Blackberry Creek near the northeast corner of the pond. Blackberry Creek then runs generally parallel to the east embankment. A box culvert structure passes under the railroad tracks on the north side of the pond, carrying surface drainage from the area north of the railroad tracks. The culvert discharges into the north ditch near the northwest corner of the Lower Pond. Surface drainage from the area south of the Lower Pond enters Blackberry Creek near the southeast corner of the pond. The major waste sources to the pond are the sluiced fly ash and boiler slag originating from the plant.

The Upper Pond stores decanted water pumped from the Lower Pond. Upper Pond water is also decanted into the South Pond to be stored for reuse in the plant. The pond surface area is approximately 17.6 acres and has an estimated maximum depth of about 15 feet. The perimeter embankment is approximately 5,700 linear feet, including 1,400 linear feet common to South Pond and about 1,700 linear feet along the west side of the Lower Pond. It ranges in height from 15 feet to 18.5 feet with an average crest width of 15 feet and downstream embankment slopes that vary from 2H:1V to 1H:1V. The major waste sources to the pond are the decant water from the Lower Pond and intermittent discharges from the coal pile runoff sump.

The South Pond stores decanted water from the Upper Pond. The water can be pumped back to the Upper Pond to maintain normal operating surface levels during high evaporation periods. The pond surface area is approximately 10.2 acres and has an estimated depth of 5 feet. The perimeter embankment is approximately 3,400 linear feet including 1,400 linear feet common to Upper Pond, and 700 linear feet adjacent to the cooling water ponds. It ranges in height from 9 feet to 11.5 feet with an average crest width of 12 feet and downstream embankment slopes of 2H:1V. The major waste source to the pond is the decant water from the Upper Pond.

Table 2.1: Summary Information for Impoundment Dam Parameters

Parameter	Value		
Dam	Upper Pond	Lower Pond	South Pond
Estimated Maximum Height (ft)	18.5	15.5	11.5
Estimated Perimeter Length (ft)	5700	5400	3400
Crest Width (ft)	15	10 to 20	12
Crest Elevation[2] (ft)	953.5	931.5	953.5
Design Side Slopes Upstream/Downstream (H:V)	NA / 2:1 to 1:1	NA / 2:1 and 1:1	NA / 2:1
Estimated Freeboard (ft) at time of site visit	1	2	2
Storage Capacity[1] (ac-ft)	NA	NA	NA
Surface Area[1] (acres)	17.6	63	10.2

[1] Estimated from drawings provided by APS.
[2] Obtained from drawings provided by APS.

There are no records of the original geotechnical design or material properties for the perimeter embankments.

2.3 Spillways

The only spillway is located near the southeast corner of the Lower Pond on the south embankment. The spillway is a trapezoidal notch approximately 26 feet wide at the top, 20 feet wide at the base and approximately 1.5 feet deep. The spillway operates as an unregulated overflow discharge allowing decanted water to flow out of the impoundment. Spillway discharges flow generally parallel to the downstream toe of the embankment approximately 800 feet to Blackberry Creek.

2.4 Intakes and Outlet Works

Boiler slag is sluiced from the plant to the Lower Pond through two 10-inch, above ground cast iron pipes. Fly ash is sluiced to the Lower Pond through one 10-inch, above ground PVC pipe. The pipes discharge into the northwestern portion of the Lower Pond at an elevation above the normal pool elevation. The alignment of the discharge pipes is shown on Figure 2. The solids from the CCW are deposited in the northwestern portion of the Lower Pond and the sluice water flows generally along the inside of the perimeter embankment to the open-water area in the southern portion of the impoundment. Water from the southern portion of the Lower Pond is pumped to the Upper Pond. Two 12-inch valves and PVC outlet pipes were installed through the embankment near the southeast corner of the Lower Pond, adjacent to the overflow spillway. The outlets are used intermittently to release decant water from the pond system. One of the outlet pipes discharges water through a V-notch weir box near the downstream toe of the embankment. Discharges flow generally parallel to the downstream toe of the embankment approximately 800 feet to Blackberry Creek. The ponds are operated with an objective to reuse as much water as possible and limit stream releases.

The Upper Pond receives decant water pumped from the Lower Pond through a 10-inch PVC pipe discharging near the west embankment section of the Upper Pond at approximate elevation 953. The pond also receives intermittent discharges from the coal pile runoff sump which is pumped up to the pond through a 10-inch PVC pipe discharging in the northwest corner. An interconnect pipe and slide gate located in the south embankment (common to the South Pond) allow water to be moved by gravity from the Upper Pond to the South Pond. Additionally, two drop-inlet interconnects consisting of 10-inch diameter, vertical PVC pipes are located in the north end of the Upper Pond to maintain the normal pool elevation of 952. The drop inlets discharge into the northern portion of the Lower Pond at an unknown elevation. Water is subsequently pumped from the Upper Pond to the ash water tank at the plant where it is reused to sluice fly ash and boiler slag to the Lower Pond.

The South Pond receives decant water from the Upper Pond as previously described. Water can be pumped back to the Upper Pond through a pump in the northwest corner of the South Pond and used for augmentation water to maintain the normal pool elevation in the Upper Pond.

2.5 Vicinity Map

Asbury Power Station is located approximately 7 miles northeast of Asbury, Missouri, as shown on Figure 1. The three CCW impoundments are located east and southeast of the station, as shown on Figure 2.

2.6 Plan and Sectional Drawings

A survey drawing of the Asbury Power Station was provided by Empire District. Construction record drawings from the original construction were not prepared.

2.7 Standard Operational Procedures

Asbury Power Station is a coal-fired, cyclone type, power plant consisting of two units with a combined generating capacity of about 232 megawatts (MW). Coal is delivered to the power plant by train, where it is then combusted to power the steam turbines. The burning of coal produces fly ash which is vented from the boiler, and coarse fragments that are removed as boiler slag. Coal combustion waste from Units 1 and 2 are wet sluiced through an elevated pipe into the Lower Pond.

The Lower Pond is used for primary settling of CCW solids, and the decanted sluice water is pumped out the impoundment into the Upper Pond. The coarse fragments settle near the discharge point in the Lower Pond and are loaded and hauled off the site for commercial use when there is a market demand.

The remaining sluiced solids are diverted into channels that are excavated through cells in the pond, allowing the ash to settle out. As the excavated channels fill with ash, new channels are excavated and the sluiced ash is diverted to these newly excavated channels. The sluiced ash flows through the cell, providing further settling of the solids before the effluent reaches an area of open-water in the southwest portion of the impoundment. Flows into or out of the

CCW impoundment system are not measured; except that flows released to Blackberry Creek through the Lower Pond outlet are measured in accordance with MDNR permit requirements.

Some of the deposited ash is excavated from the central areas of the cells and stockpiled along the edges, creating large berms around the perimeter of the cell. This creates a hydraulic gradient that enhances further migration of effluent to the central portions of the cells and eventually to the open-water areas where it can be pumped to the Upper Pond. The largest of the ash berms was observed to be approximately 15 to 20 feet above the perimeter dike crest with slopes approaching 1.5H:1V to 1H:1V.

The water level in the Lower Pond is regulated by pumps located near the west edge of the impoundment (Fig. 2) that discharge into the Upper Pond. Plant personnel check water levels in the ponds daily. Based on their readings, they start or stop pumps, or adjust gated interconnect pipes between the ponds to regulate water levels.

According to Empire District, an operation and maintenance manual currently does not exist for the CCW facilities. Plant operators perform daily inspections of the CCW facilities; however these inspections are mostly site security inspections.

3.0 Summary of Construction History and Operation

The Upper Pond was the original impoundment, constructed in 1970. In 1974, the Lower Pond was constructed to add capacity for CCW storage. The South Pond was added in 1978. Documentation of the original design and construction of the CCW facility could not be provided at the time of the inspection.

There are no records of the original geotechnical design or material properties for the perimeter embankments.

In 1987, the Empire District contracted with Black and Veatch Engineers – Architects of Kansas City for an Ash Pond Improvement Study at the Asbury Power Station. One of the objectives of this study was to evaluate observed seepage in the area of the southeast corner of the Lower Pond. Based on the results of a site investigation that included test pits and laboratory testing, Black and Veatch designed an impermeable clay barrier that was excavated and "keyed" into the underlying clay downstream of the existing crest. Plant personnel report that there has been no seepage observed since the construction of the clay barrier.

The Upper Pond was constructed at the same time as the original power plant. Therefore, CCW could not have been present prior to constructing the Upper Pond. The foundation conditions for the Lower Pond and South Pond were not documented. In general, there is no evidence to suggest that any of the pond embankments were constructed on CCW materials.

4.0 Hazard Potential Classification

4.1 Overview

According to the Federal Guidelines for Dam Safety (FEMA, 2004), the hazard potential classification for the CCW impoundments is based on the possible adverse incremental consequences that are expected to result from release of stored contents due to failure of the dam or misoperation of the dam or appurtenances. Impoundments are classified as Low, Significant, or High hazard, depending on the potential for loss of human life and/or economic and environmental damages.

4.2 Lower Pond

The Lower Pond has a surface area of about 63 acres, and a maximum embankment height of about 15.5 feet. In the absence of detailed elevation-capacity curves, the volume of the pond is estimated to be approximately 500 ac-ft, based on the maximum embankment height and general configuration of the pond. The Lower Pond has a "small" size classification in accordance with the USACE Recommended Guidelines for Safety Inspection of Dams (ER 1110-2-106) criteria.

In the event of a breach of the perimeter embankment, flows containing CCW would likely enter Blackberry Creek, which flows near the east side of the pond (Fig. 2). Blackberry Creek crosses County Road 290 about 1500 ft downstream from the Lower Pond, and crosses Thorn Road about 2400 ft downstream from County Road 290. The creek ultimately discharges into Spring River approximately 7 miles downstream. The Blackberry Creek floodway appears to be largely undeveloped between the Asbury Plant and Spring River. It appears likely that breach flows containing CCW would enter Blackberry Creek and flow an undetermined distance downstream from the Asbury Plant. In the absence of detailed hydrologic and hydraulic analyses, we have also assumed that the volume and timing of breach flows would be sufficient to overtop the County Road 290 crossing, creating a potential hazard to vehicles using the road. An uncontrolled release of the contents of the Lower Pond would be expected to reach Blackberry Creek, creating a pronounced surge in creek levels for some distance downstream from the impoundment. In the absence of detailed hydrologic and hydraulic analyses, it is impossible to know the depth of the flood surge overtopping at the County Road 290 and Thorn Road crossings.

The Lower Pond is currently used for long-term storage of CCW from the plant. In-situ moisture conditions of the stored material are expected to range from dry to fully saturated, depending on the location of the material and pond operations. A failure of the perimeter embankment, in particular the northern or eastern embankments, would be expected to mobilize significant quantities of CCW, which would be carried by breach flows into Blackberry Creek. In the absence of detailed analyses, it is impossible to predict the concentrations of CCW in the breach flows and the extent to which these materials would be carried downstream.

In the absence of detailed analyses, we believe that an uncontrolled release of the Lower Pond contents due to embankment failure or misoperation is unlikely to result in loss of human life and would cause little economic damage outside of Empire District property; however, the release of CCW into Blackberry Creek adjacent to and downstream of the Lower Pond would cause environmental damage. The potential for and magnitude of overtopping at the CR 290 road crossing is unknown and could represent an increased downstream risk. We recommend classifying the Lower Pond perimeter embankments as a “Significant” hazard in accordance with the Federal Guidelines for Dam Safety. Upon review of the Missouri dam safety regulations (“Rules of Department of Natural Resources,” Division 22, Chapters 1, 2 and 3), the provisions of the applicable federal guidelines are judged to be more stringent and are used as the basis for evaluation in this report.

4.3 Upper Pond

The Upper Pond has a surface area of about 17.6 acres, and a maximum height of about 18.5 feet. In the absence of detailed elevation-capacity curves, the volume of the pond is estimated to be approximately 330 ac-ft. The Upper pond has a “small” size classification in accordance with the USACE Recommended Guidelines for Safety Inspection of Dams (ER 1110-2-106) criteria.

Based on our site visit and review of available information, it appears that a breach of the perimeter embankment of the Upper Pond is unlikely to result in a release of the pond contents outside of Empire District property. A breach of the east embankment would most likely release the pond contents into the Lower Pond, where it appears that the full Upper Pond contents would be contained. The south embankment is common to the South Pond, and a breach would result in equalization of the water levels between the two units. A breach of the north or west embankments would inundate portions of the plant site, but would be contained on Empire District property. The associated flooding depths and flow velocities are expected to be relatively low and are not considered to pose a significant hazard to plant personnel.

An uncontrolled release of the Upper Pond contents due to embankment failure or misoperation is unlikely to result in loss of human life and would cause no economic or environmental damage outside of Empire District property.

We recommend classifying the Upper Pond perimeter embankments as “Low” hazard in accordance with the Federal Guidelines for Dam Safety.

4.4 South Pond

The South Pond has a surface area of about 10.2 acres, and a maximum height of about 11.5 feet. In the absence of detailed stage-storage curves, the volume of the pond is estimated to be about 120 ac-ft. The South Pond has a “small” size classification in accordance with the USACE Recommended Guidelines for Safety Inspection of Dams (ER 1110-2-106) criteria.

The north embankment is common to the Upper Pond, and a breach would result in equalization of the water levels between the two units. A breach of the south or east perimeter embankments would release the pond contents to a natural drainage feature that would convey the water to the east, where it would discharge into Blackberry Creek near the southeast corner of the Lower Pond. Flood outflows from the South Pond would likely create a nominal to small surge in Blackberry Creek. In the absence of detailed hydrologic and hydraulic analyses, the potential for these flows to overtop the County Road 290 crossing is expected to be very low.

The west embankment is common to the Cooling Water Reservoir. The crest of the Cooling Water Reservoir is approximately 10 ft above the South Pond embankments. In this case, the dam safety issue is judged to be relative to a failure of the Cooling Water Reservoir embankment, releasing the reservoir contents into the South Pond. Based on our review of available information, it appears that such a failure would result in cascading failure of the South Pond perimeter embankment, and release of both the South Pond and Cooling Water Reservoir contents to the area east and south of the ash ponds, and then into Blackberry Creek. Evaluation of the Cooling Water Reservoir embankment is outside the scope of the current study, and so is not considered or addressed in this report.

An uncontrolled release of the South Pond contents due to embankment failure or misoperation is not expected to cause loss of human life or significant economic loss. As currently operated, the South Pond stores decant water that has passed through both the Lower and Upper Ponds, and is expected to have low concentrations of CCW. On this basis, we believe that the water presents a low environmental risk.

We recommend classifying the South Pond embankment as “Low” hazard in accordance with the Federal Guidelines for Dam Safety.

5.0 Hydrology and Hydraulics

5.1 Floods of Record

Floods of record have not been evaluated and documented for the CCW impoundments at the Asbury Power Station.

5.2 Inflow Design Floods

Currently there are no hazard classifications for the three CCW impoundments at the APS. As documented in Section 4.0, we recommend classifying the Lower Pond as "Significant" hazard, and the Upper and South Ponds as "Low" hazard.

The USACE Recommended Guidelines for Safety Inspection of Dams (ER 1110-2-106) recommends that small "Significant" hazard dams should be capable of safely passing or storing an inflow design flood (IDF) with a magnitude ranging from the 100-year to the 50-percent probable maximum flood (PMF). Considering the "Significant" hazard rating, the current uncertainties regarding flood impacts to the County Road 290 crossing, the scale of the environmental damages that could potentially occur upon failure, and the recommended range of inflow design storms, we recommend selecting the 50-percent PMF (i.e. the flood resulting from a storm equal to 50 percent of the probable maximum precipitation [PMP]) as the IDF for the Lower Pond.

Because of the potential for a cascading failure of the Upper and Lower Ponds under IDF conditions, we also recommend selecting the 50-percent PMF as the IDF for the Upper Pond.

The USACE range of suggested IDFs for small "Low" hazard dams is the 50-yr to 100-yr runoff events. We recommend selecting the 100-yr runoff event as the IDF for the South Pond.

The configuration of the APS ash ponds is such that they are effectively above grade; thus the contributing drainage area is limited in all three cases to the surface area of the ponds. Short-duration storms typically produce a higher peak runoff, which is important in sizing spillways; however, longer-duration storms typically produce a greater volume of runoff, which is critical for flood runoff storage applications. Total and peak precipitation values for the 50-percent PMP and 100-yr storms are provided in Table 5.1.

Table 5:1: 50-percent PMP and 100-yr Precipitation Depths

Precipitation Event	Total Precipitation Depth	Peak Precipitation Depth
50-percent PMP, 6-hr duration[1]	14.2 inches	2.25 inches in 60 minutes
50-percent PMP, 72-hr duration[1]	21.1 inches	
100- yr, 6-hr duration[2]	6.1 inches	n/a
100-yr, 24-hr duration[2]	8.4 inches	

[1] Hydrometeorological Report Number 51
[2] NOAA Flood Frequency Atlas

The IDF evaluations presented below assume no losses (total flood volume equal to total precipitation) and instantaneous response of flood inflow/outflow rate to precipitation.

5.2.1 Lower Pond

The Lower Pond contributing drainage area is limited to the total surface area of the pond (approximately 63 acres). The topography within the Lower Pond is irregular and continually changing. Currently, there is a network of excavated drainage channels within the ash pond that route water through the impoundment to the open-water storage area, which is estimated to have a current surface area equal to about 30% of the total pond area, or approximately19 acres.

The Lower pond perimeter embankment crest elevation is approximately 931.5 (Table 2.1). As currently operated, the water level is maintained at an elevation of approximately 929, about 2.5 feet below the embankment crest and providing about 48 ac-ft for temporary flood surcharge storage. The remaining pond area is generally elevated above the embankment crest through the long-term storage of CCW, and is judged for this evaluation to be ineffective for containment of storm water. Thus, the Lower Pond is assumed to have a total of approximately 48 ac-ft of volume available to store the IDF.

The spillway on the south perimeter embankment has an estimated crest elevation of 930 based on site topography provided by APS staff. With a 20-ft bottom width and 2H:1V side slopes, the spillway is estimated to have a capacity of about 115 cfs with the pond water surface at the embankment crest.

The 72-hr 50-percent PMP has a total precipitation depth of 21.1 inches, which is equivalent to approximately 110 ac-ft of volume over the total Lower Pond surface area. This volume is significantly greater than the estimated flood storage capacity of the pond.

The 50% PMP has a peak precipitation amount of 2.25 inches for a duration of 60 minutes. Assuming no losses and ignoring precipitation/runoff timing effects, this precipitation amount over the total pond surface area translates to a peak IDF flow of about 145 cfs. This flow rate is approximately 25 percent greater than the estimated discharge capacity of the existing spillway.

Based on the factors cited in the previous two paragraphs, and in the absence of detailed hydrologic and hydraulic analyses, the storm runoff from the recommended IDF is expected to overtop and fail the Lower Pond perimeter embankment.

5.2.2 Upper Pond and South Pond

For purposes of evaluating IDF capacity, the Upper pond and South Pond are considered as a single unit. The contributing drainage area is limited to the total surface of the combined ponds, approximately 27.8 acres.

As currently operated, the Upper Pond and South Pond water levels are maintained at El. 952.5 about 1.0 foot below the crest of the embankment, providing about 27.8 ac-ft of volume available for flood storage. Since neither pond has a spillway, the IDF must be contained within the available flood storage volume.

The 72-hr 50-percent PMP has a total precipitation depth of 21.1 inches, which is equivalent to approximately 50 ac-ft of volume over the total Upper plus South Pond surface area. This volume is significantly greater than the estimated flood storage capacity of the pond.

Since the estimated flood volume is substantially greater than the available flood storage capacity, the storm runoff from the recommended IDF is expected to overtop and fail one or more of the Upper or South Pond perimeter embankments.

5.2.3 Determination of the PMF

Not applicable.

5.2.4 Freeboard Adequacy

Based on a very simplified evaluation using conservative assumptions, the Lower Pond freeboard appears to be inadequate.

Since the IDF is expected to overtop the embankments for the combined Upper and South Ponds, the freeboard is judged to be inadequate for these impoundments.

5.2.5 Dam Break Analysis

Dam break analyses have not been performed for the three CCW impoundments at the Asbury Power Station.

5.3 Spillway Rating Curves

There is no rating curve for the Lower Pond spillway. Based on our preliminary estimate, the spillway has a capacity of approximately 115 cfs with the pond water surface at the embankment crest. The Upper and South Ponds do not have spillways.

5.4 Evaluation

Based on the current facility operations and very preliminary IDF evaluations documented in this Report, the CCW impoundments at the APS appear to have inadequate capacity to safely store and/or pass the recommended IDF without overtopping the perimeter embankments.

6.0 Geologic and Seismic Considerations

There are no records of the original geotechnical design or material properties for the perimeter embankments.

The Meramecian rock series occurs over approximately 80 percent of Jasper County and includes the Warsaw Limestone overlain by varying thicknesses of shale and sandstone. Recent weathering and solutioning has created a highly irregular limestone surface that consists of residual soils or eroded areas subsequently backfilled by clay, sand and gravel (U.S. Geological Survey, Geologic Units in Jasper County, Missouri).

In 1987, the Empire District contracted with Black and Veatch Engineers – Architects of Kansas City for an Ash Pond Improvement Study at the Asbury Power Station. As part of the study, Black and Veatch performed a site investigation that included test pits and laboratory testing. Test pit logs indicate that the predominant overburden soil consists of brown to gray clay, silty clay and fine sand to gravel.

Specific geologic information about the underlying bedrock in the area was limited to the observed occurrences of weathered, thinly bedded, gray shale and weathered, thinly bedded red sandstone encountered in the bottom of several test pits.

6.1 Site Seismic Risk

We are not aware of any seismic analyses that have been performed on the perimeter embankments at the Asbury Power Station CCW impoundment. According to the 2008 U.S. Geological Survey (USGS) Seismic Hazard Map, the site has a regional probabilistic peak ground acceleration of approximately 0.06g with a 2 percent Probability of Exceedance within 50 years (recurrence interval of approximately 2,500 years).

7.0 Instrumentation

7.1 Location and Type

Instrumentation at the APS ash ponds is limited to a V-notch weir at the Lower Pond stream release outlet. When the outlet is operating, weir readings are manually observed and recorded by plant staff. Water levels in the ponds are regularly measured and recorded by plant staff. Correlations of water level to flow rate for the gravity interconnect pipes have been developed by the plant staff; however, flow records are not normally maintained. Water level readings from the ponds are referenced to adjacent structures, not a common elevation datum.

7.2 Readings

7.2.1 Flow Rates

Flow rates are not recorded at any of the CCW impoundments.

7.2.2 Staff Gauges

There are no staff gages at any of the CCW impoundments.

7.3 Evaluation

There are no regularly-used instruments installed at the APS CCW impoundments. It would be beneficial to install the following instrumentation at the APS ash ponds:

- Staff gages and flow measurement devices to measure and record water levels in the ash ponds and flows into and out of the ash ponds.
- Surveyed benchmarks and embankment settlement monuments to measure and record any movement of the perimeter embankments and to tie measurements to a known vertical and horizontal datum.
- Piezometers at the crest and the downstream toe at several locations along the Lower Pond perimeter embankments to monitor embankment and foundation seepage conditions.

8.0 Field Assessment

8.1 General

A site visit to assess the condition of the CCW impoundments at the Asbury Power Station was performed on November 4, 2010, by Brian Johnson, P.E., and Jim Wright, P.G. of GEI. David Eaton, Bob Bromley, Mary Campbell and Kavan Stull of Empire District assisted in the assessment.

The weather during the site visit was partly cloudy, with temperatures around 60 degrees Fahrenheit. The majority of the ground was dry at the time of the site visit.

At the time of inspection, GEI completed an EPA inspection checklist, which is provided in Appendix A, and photographs, which are provided in Appendix B. Field assessment of the three CCW impoundments included a site walk to observe the dam crest, upstream slope, downstream slope, and intake structures.

8.2 Embankment Dam

8.2.1 Lower Pond

Visual inspection was limited to the perimeter embankments on the north, east and south sides of the Lower Pond.

The upstream slopes were obscured by the impounded water and thick cattail growth around most of the shoreline and were not accessible for inspection. There was a grass-lined perimeter drainage ditch approximately 4 to 8 feet across and 3 to 4 feet deep on the inside slope of the perimeter embankment crest. The ditch collects surface runoff and decanted sluice water from the interior of the pond and conveys it into the open-water area on the south side of the pond. The upstream slope protection appeared to be in satisfactory condition where observed. No evidence of scarps, sloughs, depressions or other indications of slope instability or signs of erosion were observed.

The dam appeared to be in good condition. No evidence of cracking, settlement, movement, erosion or deterioration were observed. The dam crest surface was generally composed of gravel road base material, coarse-grained boiler slag or native grassy vegetation.

The downstream slopes were covered with dense grassy vegetation and some areas of heavy brush and deciduous tree growth. No evidence of scarps, sloughs, depressions or other indications of slope instability or signs of erosion were observed. Animal burrows, up to 6 inches in diameter, were observed on the downstream slope of the south embankment section and appeared to extend into the embankment. There was evidence of recent tree and brush clearing activity on the south and east embankments. Plant personnel reported that clearing activities were in progress, with the intention of clearing all of the downstream embankment slopes.

There was flowing water in the drainage channel adjacent to the north embankment and in Blackberry Creek along the east side of the pond. Beaver activity had backed up water in several locations. A significant source of this water appeared to be surface flows from the area north of the plant railroad tracks. In areas where the embankment toe and drainage channel were relatively separated, the embankment toe was dry and firm. The downstream toe area along the south embankment was dry and firm. Since it is fed by onsite surface runoff and runoff from adjacent properties, the amount of water in the ditch originating from the plant facilities is unknown.

8.2.2 Upper and South Ponds

Visual inspection was limited to the perimeter embankments of the combined Upper and South Ponds. The interior dike separating the Upper and South Ponds was not inspected.

The upstream slopes were obscured by the impounded water and thick cattail growth around most of the shoreline and were not accessible for inspection. The upstream slope protection appeared to be in satisfactory condition where observed. No evidence of scarps, sloughs, depressions or other indications of slope instability or signs of erosion were observed.

The crest appeared to be in good condition. No evidence of cracking, settlement, movement, erosion or deterioration were observed. The dam crest surface was generally composed of gravel road base material, coarse grained boiler slag or native grassy vegetation.

The downstream slopes were covered with dense grassy vegetation and some areas of heavy brush and deciduous tree growth. No evidence of scarps, sloughs, depressions or other indications of slope instability or signs of erosion were observed. Animal burrows, up to 6 inches in diameter, were observed on the downstream slope of the south embankment section and appeared to extend into the embankment. There was evidence of recent tree and brush clearing activity on the south and east embankments. Plant personnel reported that clearing activities were in progress, with the intention of clearing all of the downstream embankment slopes.

Areas of standing water were observed downstream of the toes of the north and west embankment sections. These areas are coincident with the accumulation of plant surface runoff, collection of seepage from the Cooling Reservoir, cooling tower runoff and beaver activity in the ditch adjacent to the railroad grade. At locations away from the standing water, the embankment toe was dry and firm.

Standing water was also observed in an excavated borrow area approximately 50 feet downstream of the south embankment section. The origin of the water is unknown, but appeared to be surface runoff from adjacent areas.

8.3 Seepage and Stability

No evidence of ongoing seepage or potential seepage was observed at any of the CCW impoundments.

8.4 Appurtenant Structures

8.4.1 Outlet Structures

Outlet and interconnect structures were typically inundated during the inspection. Structures and equipment that were visible appeared to be in good condition.

8.4.2 Pump Structures

The pump equipment was not inspected during this visit. Plant personnel indicated that all pump equipment was working properly.

8.4.3 Emergency Spillway

The emergency spillway near the southeast corner of the Lower Pond was covered with vegetation, but the structure appeared to be in generally good condition.

8.4.4 Water Surface Elevations and Reservoir Discharge

There is no instrumentation associated with the impoundments at Asbury Power Station. The records of water level readings from the ponds, provided by APS staff, were referenced to adjacent structures, not to an elevation datum.

There was no observed outflow from the CCW impoundments during the inspection. Water is normally pumped from the CCW impoundments to the plant for reuse. The plant was being re-started at the time of the inspection, and it is unknown if water was being re-circulated to the plant at the time.

9.0 Structural Stability

9.1 Visual Observations

The assessment team saw no visible signs of instability associated with the interior or exterior dikes of the three impoundments during the November 4, 2010 site assessment.

Ash stored in the Lower Pond is stored in large piles approximately 25 feet high along the north and east portions of the storage cell. These storage piles create an inner ash basin which was observed to be higher than the perimeter embankments. This ash could potentially become saturated during storm events and induce higher than anticipated loads on the perimeter embankments, most notably the east embankment.

9.2 Field Investigations

No subsurface field investigation reports were provided for the original construction of the perimeter embankments.

In 1987, the Empire District contracted with Black and Veatch Engineers – Architects of Kansas City for an Ash Pond Improvement Study at the Asbury Power Station. As part of the study, Black and Veatch performed a site investigation that included test pits and laboratory testing. Test pit logs indicate that the predominant overburden soil consists of brown to gray clay, silty clay and fine sand to gravel.

9.3 Structural Analyses

No structural analyses have been performed for the Ash Pond containment embankments at the APS.

Overall, the embankments appeared to be generally stable for the existing loading conditions. The upstream slopes were mostly inundated at the time of the inspection, and there was no information available regarding design or current slope geometry. The reported crest widths are reasonable for the respective embankment heights. The downstream slopes were observed to be in good condition relative to slope instability, but appear to be over-steepened in some areas.

The Lower Pond serves as a permanent disposal area for CCW from the plant. Historic and current operation of the ponds has resulted in CCW deposits that are considerably higher in some areas than the perimeter embankment crest elevations. These CCW piles impose significant surcharge loads on the perimeter embankments that could reduce the overall stability of these features. There was no evidence available to suggest that the surcharge loads imposed by the current ash piles have been considered in embankment stability assessments.

There was no evidence available to suggest that the liquefaction potential of the CCW material stored in the Ash Ponds has been evaluated. Conditions necessary for liquefaction include saturated, loose, granular soils and seismic or other loading of sufficient magnitude and duration to cause significant strength loss in the soil. The CCW materials are hydraulically deposited and likely include zones of loose, saturated ash and possibly thin layers of weak, fine ash. These materials are expected to be susceptible to rapid loss of strength when subjected to increased loads. Loading conditions that could induce liquefaction include earthquake shaking and those associated with steep slopes or rapid deposition of the CCW.

10.0 Maintenance and Methods of Operation

10.1 Procedures

Empire District does not have a formal Operation and Maintenance Manual in which standard operating procedures exist for the CCW impoundments. Environmental compliance inspections of the plant facilities are conducted by the Missouri Department of Natural Resources on an unannounced schedule. Visual inspections of the CCW impoundments are made on a daily basis by APS plant personnel. A third party inspection of the Lower Pond embankments was made by Black and Veatch as part of their 1987 study.

10.2 Maintenance of Impoundments

Maintenance of the three CCW impoundments is performed by APS staff under the guidance of APS managers and engineers. Dam safety-related inspections have not been previously made by state or federal agencies.

10.3 Surveillance

The ash ponds and settling basins are patrolled once daily by APS operations personnel. Plant personnel are available at the power plant and on 24-hour call for emergencies that may arise.

11.0 Conclusions

11.1 Assessment of Dams

11.1.1 Field Assessment

The dams and outlet works facilities associated with the CCW impoundments at the Asbury Power Station appeared to be in satisfactory condition. No visual signs of instability, movement or seepage were observed. Issues of potential concern for the CCW impoundments identified from our field assessment are as follows:

- The perimeter embankment downstream slopes have heavy brush and trees up to 6 inches in diameter on the slopes and in close proximity to the downstream toe in multiple locations around the perimeter of the CCW impoundments.
- Rodent burrows were observed in several locations on the downstream slopes, extending into the embankment. Burrow diameters were up to about 6 inches in diameter.
- The storage of large quantities of CCW in the interior of the Lower Pond induces potentially significant surcharge loads on the perimeter embankments. In addition, the liquefaction potential of CCW stored in the Lower Pond is unknown.

11.1.2 Adequacy of Structural Stability

There are no records of a structural stability evaluation of the CCW impoundments.

11.1.3 Adequacy of Hydrologic/Hydraulic Safety

The CCW impoundments appear to have inadequate capacity to safely pass and/or store the recommended IDF. There are no stage-storage curves for the impoundments, and there is no stage-discharge curve for the Lower Pond spillway.

11.1.4 Adequacy of Instrumentation and Monitoring of Instrumentation

There is currently very little instrumentation installed at the CCW impoundments. Water levels and flow measurements are estimated visually; water surface elevations are locally referenced to an adjacent structure.

11.1.5 Adequacy of Maintenance and Surveillance

The maintenance and surveillance programs for the CCW impoundments are judged to be fair. Overall, the facilities appear to be adequately maintained and routine surveillance is performed by APS staff. Significant portions of the downstream embankment slopes are overgrown with heavy brush and trees, and numerous rodent burrows extending into the embankment from the downstream slopes were observed. There are no plant staff members trained in dam safety inspections. There are currently no scheduled inspections by third party engineering companies experienced in dam safety inspections.

11.1.6 Adequacy of Project Operations

Operating personnel appear to be generally knowledgeable and are well-trained in the operation of the project.

12.0 Recommendations

12.1 Corrective Measures and Analyses for the Structures

1. Continue and improve vegetation control efforts to maintain the downstream embankment slopes free of heavy vegetation and tree growth. Existing trees should be removed to prevent the root systems from creating seepage paths through the embankment slopes. A minimum of about 25 feet of clear space should be provided between the downstream toe and the tree line. Removal of root balls of large trees can cause additional damage to an embankment and removal is not recommended without appropriate engineering planning and consideration.
2. Conduct a geotechnical exploration program to assess the embankment and foundation soils materials types and properties. A geotechnical soils testing program should accompany the drilling program and should include index property tests along with strength tests. The program should be developed to provide the information needed to perform slope stability analyses on the perimeter embankments.
3. Perform slope stability analyses for the perimeter embankments of the CCW impoundments. Analyses should be made for the maximum section of each embankment with a phreatic surface representative of steady seepage under normal water surface conditions. Stability analyses should be performed for the full range of expected loading conditions, including appropriate application of equipment and surcharge loads related to the storage of CCW in the Lower Pond. The analyses should also evaluate stability of the existing ash stockpiles within the perimeter embankments.
4. Evaluate the liquefaction potential of CCW stored in the Lower Pond. Based on findings of the liquefaction evaluation, assess the potential impacts with respect to perimeter embankment stability.
5. Perform hydrologic and hydraulic analyses of the CCW impoundments. Assess the ability of the ash pond facilities to safely pass and/or store the recommended IDF. As part of the hydrologic analysis, develop accurate stage-storage curves for the impoundments and stage-discharge curves for spillway(s).

12.2 Corrective Measures Required for Instrumentation and Monitoring Procedures

Install piezometers at various locations on the perimeter embankments of the Lower Pond and South Pond to facilitate monitoring seepage through the embankments and foundations. Install survey monuments on the embankments to enable monitoring of potential embankment movements.

12.3 Corrective Measures Required for Maintenance and Surveillance Procedures

Conduct and document informal annual inspections of the CCW impoundments by APS personnel trained in dam safety evaluations. Have the CCW impoundment perimeter embankments inspected by a third party professional engineer with experience in dam safety evaluations at a minimum of every 5 years. Consider developing and implementing a brief daily check inspection of the facilities to be conducted by APS personnel.

Implement early warning measures to more closely monitor water levels in the CCW impoundments and reduce the potential for overtopping failure of the embankments. Early warning measures could include enhanced visual surveillance and/or automated water level and alarm systems. Automated water level and alarm systems, if included in the early warning measures, should be installed at the Lower Pond Ponds and the South Pond.

12.4 Corrective Measures Required for the Methods of Operation of the Project Works

None.

12.5 Summary

The following factors were the main considerations in determining the final rating of the three CCW impoundments at Asbury Power Station.

- The Lower Pond perimeter embankment is a significant-hazard structure based on federal classification criteria.
- The Upper Pond perimeter embankment is a low-hazard structure based on federal classification criteria.
- The South Pond perimeter embankment is a low-hazard structure based on federal classification criteria.
- The three CCW impoundments were observed to be in generally good condition at the time of the field assessment.
- There are no hydrologic/hydraulic analyses on record indicating that the facilities can safely pass and/or store the recommended IDF. There are no stage-storage curves for the ponds, and there is no stage-discharge curve for the Lower Pond spillway.
- There are no stability analyses on record for the CCW impoundments.
- There are no means to accurately measure and record water levels and flow volumes. There are no means to monitor perimeter embankment performance (i.e. movement, settling, seepage, etc.).
- Maintenance, surveillance and operational procedures are considered fair.

12.6 Acknowledgement of Assessment

I acknowledge that the management unit(s) referenced herein was personally inspected by me and was found to be in the following condition **(select one only):**

SATISFACTORY

FAIR

POOR

UNSATISFACTORY

DEFINITIONS:

SATISFACTORY: No existing or potential management unit safety deficiencies are recognized. Acceptable performance is expected under all applicable loading conditions (static, hydrologic, seismic) in accordance with the applicable criteria. Minor maintenance items may be required.

FAIR: Acceptable performance is expected under all required loading conditions (static, hydrologic, seismic) in accordance with the applicable safety regulatory criteria. Minor deficiencies may exist that require remedial action and/or secondary studies or investigations.

POOR: A management unit safety deficiency is recognized for any required loading condition (static, hydrologic, seismic) in accordance with the applicable dam safety regulatory criteria. Remedial action is necessary. POOR also applies when further critical studies or investigations are needed to identify any potential dam safety deficiencies.

UNSATISFACTORY: Considered unsafe. A dam safety deficiency is recognized that requires immediate or emergency remedial action for problem resolution. Reservoir restrictions may be necessary.

I acknowledge that the management unit referenced herein:

Has been assessed on November 4, 2010

Signature: ___________________________

List of Participants:

Brian Johnson, P.E.	Senior Project Engineer / Task Leader, GEI Consultants, Inc.
Jim Wright, P.G.	Project Geologist, GEI Consultants, Inc.
David Eaton	Maintenance Manager, Empire District
Bob Bromley, P.E.	Plant Manager, Empire District
Mary Campbell	planning and Results Manager, Empire District
Kavan Stull	Environmental/Safety Services, Empire District

13.0 References

Empire District Electric Company (2009). “CERCLA 104(e) Request for Information Response,” prepared for U.S. Environmental Protection Agency, March 25, 2009.

Missouri Department of Natural Resources (MDNR), Dam and Reservoir Safety Program, Rules of Department of Natural Resources, Division 22- Dam and Reservoir Safety Council, Chapters 1, 2 and 3.

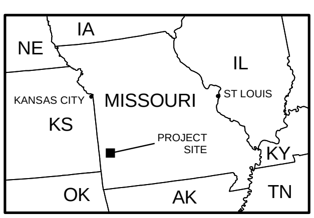
Missouri Department of Natural Resources (MDNR), Division of Geology and Land Survey, Reconnaissance Geologic Map of the Asbury Quadrangle, 1:24,000, Smith D. C., 1988.

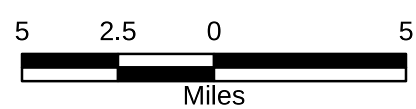
U.S. Army Corps of Engineers (USACE) (1979). “Recommended Guidelines for Safety Inspections of Dams. (ER 1110-2-106).” September 26.

Federal Energy Regulatory Commission (FERC) (Rev, 2006). “Engineering Guidelines for the Evaluation of Hydropower Projects, Embankment Dams (Chapter IV)”, September 2006.

Federal Emergency Management Agency (FEMA). Federal Guidelines for Dam Safety: Hazard Potential Classification System for Dams (FEMA 33), January 2004.

Figures





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Assessment of Dam Safety of Coal Combustion
Waste Impoundments at
Empire District Electric, Asbury Station

Environmental Protection Agency
Washington, D.C.

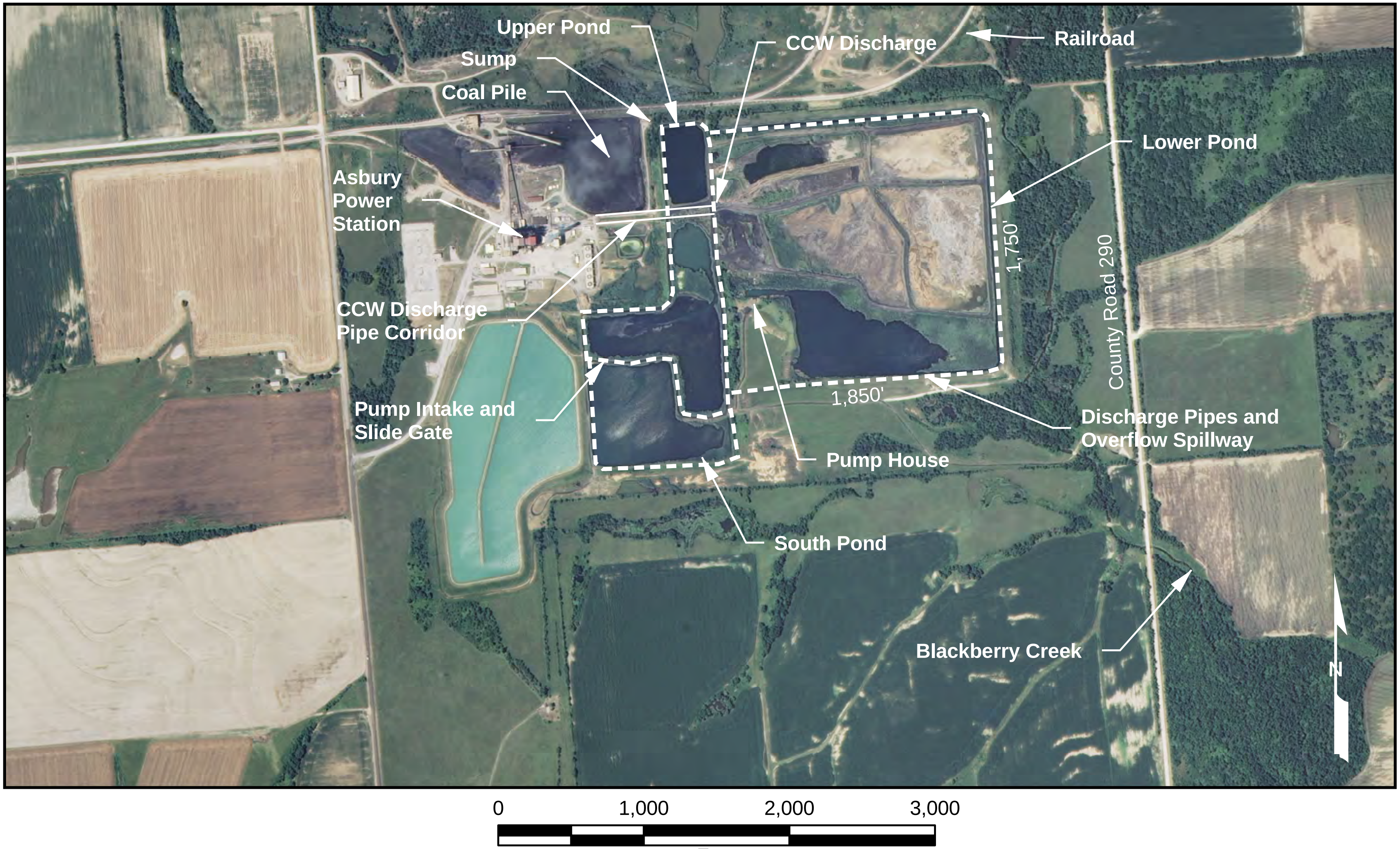
GEI Consultants

SITE VICINITY MAP

Project 092884

January 2011

Figure 1



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SOURCE: Base map is USDA NAIP imagery, Jasper County, Missouri, 2009.

Assessment of Dam Safety of Coal Combustion Waste Impoundments at Empire District Electric, Asbury Station	GEI Consultants	SITE MAP
Environmental Protection Agency Washington, D.C.	Project 092884	January 2011 Figure 2

Appendix A

Inspection Checklists – November 4, 2010

Site Name: Asbury Power Station (APS) Date: 11- 4- 2010

Unit Name: Upper Pond Operator's Name: Empire District Electric Company

Unit ID: MO - 0095362 Hazard Potential Classification: High **Significant** Low

Inspector's Name: **Brian Johnson/ GEI Consultants; Jim Wright/ GEI Consultants**

Check the appropriate box below, Provide comments when appropriate. If not applicable or not available, record "N/A", Any unusual conditions or construction practices that should be noted in the comments section, For large diked embankments, separate checklists may be used for different embankment areas. If separate forms are used, identify approximate area that the form applies to in comments.

	Yes	No		Yes	No
1. Frequency of Company's Dam Inspections?	**Monthly**		18. Sloughing or bulging on slopes?		X
2. Pool elevation (operator records)?	**952.5**		19. Major erosion or slope deterioration?		X
3. Decant inlet elevation (operator records)?	**952.5**		20. Decant Pipes		
4. Open channel spillway elevation (operator records)?	**N/A**		Is water entering inlet, but not exiting outlet?		X
5. Lowest dam crest elevation (operator records)?	**953.5**		Is water exiting outlet, but not entering inlet?		X
6. If instrumentation is present, are readings recorded (operator records)?	**N/A**		Is water exiting outlet flowing clear?	X	
7. Is the embankment currently under construction?		**X**	21. Seepage (specify location, if seepage carries fines, and approximate seepage rate below):		
8. Foundation preparation (remove vegetation, stumps, topsoil in area where embankment fill will be placed)?	N/A		From underdrain?		X
9. Trees growing on embankment? (If so, indicate largest diameter below.)	**X**		At isolated points on embankment slopes?		X
10. Cracks or scarps on crest?		X	At natural hillside in the embankment area?		X
11. Is there significant settlement along the crest?		X	Over widespread areas?		X
12. Are decant trashracks clear and in place?	**N/A**		From downstream foundation area?		X
13. Depressions or sink holes in tailings surface or whirlpool in the pool area		X	"Boils" beneath stream or ponded water?		X
14. Clogged spillways, groin or diversion ditches?	N/A		Around the outside of the decant pipe?		X
15. Are spillway or ditch linings deteriorated?	N/A		22. Surface movements in valley bottom or on hillside?		X
16. Are outlets of decant or underdrains blocked?		X	23. Water against downstream toe?	X	
17. Cracks or scarps on slopes		X	24. Were Photos taken during the dam inspection?	X	

Major adverse changes in these items could cause instability and should be reported for further evaluation. Adverse conditions noted in these items should normally be described (extent, location, volume, etc.) in the space below and on the back of this sheet.

Inspection Issue #	Comments
9. Trees growing on embankment?	**9. Trees up to 6 inches in diameter. Tree clearing was occurring during the inspection.**
23. Water against downstream toe?	**23. Plant surface water and blow-down water collects along the north and west facing toes.**

Coal Combustion Waste (CCW)
Impoundment Inspection

Impoundment NPDES Permit # MO - 0095362 INSPECTOR : Brian Johnson/ GEI

Date 11- 4 - 10

Impoundment Name Upper Pond – Asbury Power Station

Impoundment Company **Empire District Electric Company**

EPA Region **8**

State Agency (Field Office) Address **1595 Wynkoop St**

Denver, CO 80202

Name of Impoundment Upper Pond
(Report each impoundment on a separate form under the same Impoundment NPDES Permit number)

New ______ Update ______

	Yes	No
Is impoundment currently under construction?		X
Is water or ccw currently being pumped into the impoundment?	X	

IMPOUNDMENT FUNCTION: Decantation and augmentation water

Nearest Downstream Town: Name Asbury, MO
Distance from the impoundment **7 miles**
Impoundment
Location:

Longitude	**94**	Degrees	**35**	Minutes	**08**	Seconds
Latitude	**37**	Degrees	**21**	Minutes	**35**	Seconds
State	MO	County	Jasper			

Does a state agency regulate this impoundment? YES X NO ____

If So Which Sate Agency? Missouri Department of Natural Resources (MDNR), Water Pollution Control

HAZARD POTENTIAL (In the event the impoundment should fail, the following would occur):

______ **LESS THAN LOW HAZARD POTENTIAL**: Failure or misoperation of the dam results in no probable loss of human life or economic or environmental losses.

______ **LOW HAZARD POTENTIAL:** Dams assigned the low hazard potential classification are those where failure or misoperation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.

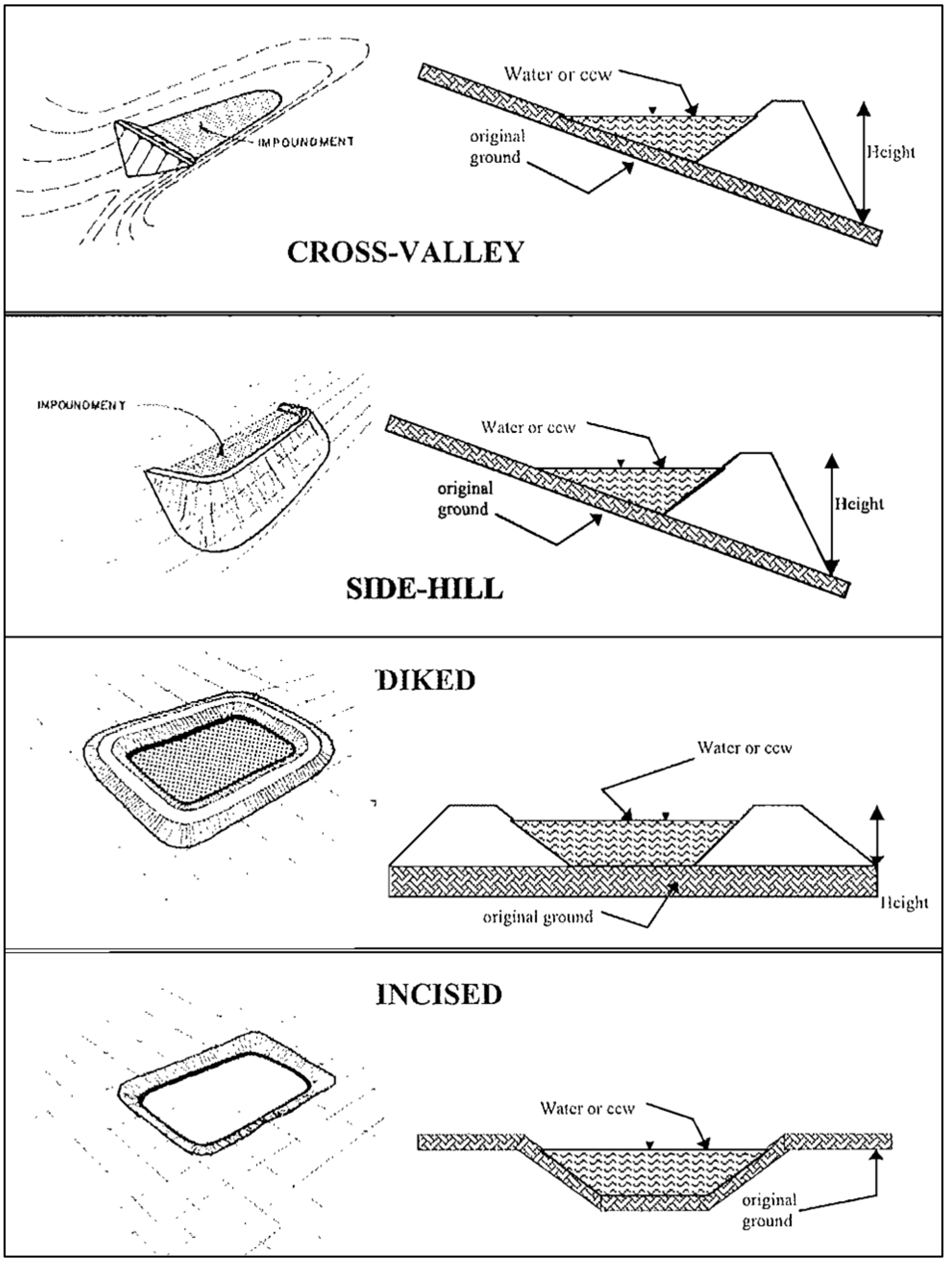
__X__ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure.

______ **HIGH HAZARD POTENTIAL:** Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

An uncontrolled release of the structure's contents due to a failure or misoperation is not considered to cause loss of human life, however, CCW would flow into the adjacent drainage and areas surrounding the pond. Based on potential environmental impacts to property adjacent to the owner's land, the dam should be classified as a "SIGNIFICANT" hazard structure which is consistent with Federal Guidelines for Dam Safety.

CONFIGURATION:



______ Cross-Valley

______ Side-Hill

__X__ Diked

______ Incised (form completion optional)

______ Combination Incised/Diked

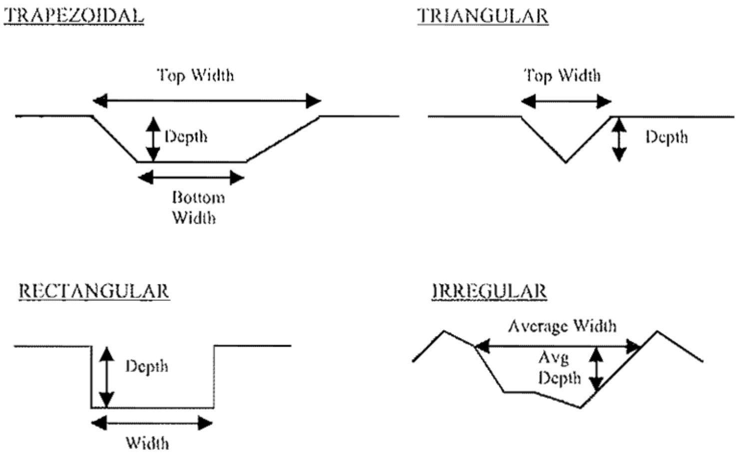
Embankment Height 18.5 feet   Embankment Material Clays

Pool Area 17.6 acres   Liner N/A

Current Freeboard 1 feet   Liner Permeability N/A

N

<u>TYPE OF OUTLET</u> (Mark all that apply)

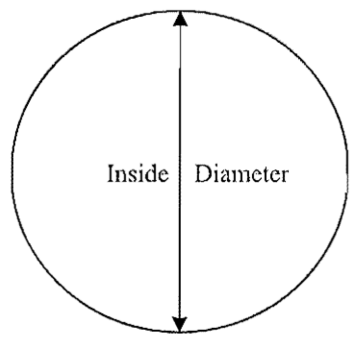


<u>N/A</u> **Open Channel Spillway**
______ Trapezoidal
______ Triangular
______ Triangular

______ Depth
______ Bottom (or average) width
______ Top width

__X__ **Outlet**

__10”__ inside diameter



Material
______ corrugated metal
______ welded steel
______ concrete
__X__ plastic (hdpe, pvc, etc.)
______ other (specify________________

Is water flowing through the outlet? YES__X__ NO______

______**No Outlet**

______ **Other Type of Outlet (Specify)** **<u>There are a total of four 10-inch drop inlet pipes</u>**

The Impoundment was Designed By ____

____

Has there ever been a failure at this site? YES ______ NO __X__

If So When? ____________________

If So Please Describe:

Has there ever been significant seepages at this site? YES ______ NO __X__

If So When? ____

If So Please Describe:

Has there ever been any measures undertaken to monitor/lower Phreatic water table levels based on past seepages or breaches at this site? YES ______ NO __X__

If So which method (e.g., piezometers, gw pumping, …)? ________________________

If So Please Describe:

Site Name: Asbury Power Station Date: 11- 4- 2010

Unit Name: Lower Pond Operator's Name: Empire District Electric Company

Unit ID: MO - 0095362 Hazard Potential Classification: High **Significant** Low

Inspector's Name: **Brian Johnson/ GEI Consultants; Jim Wright/ GEI Consultants**

Check the appropriate box below, Provide comments when appropriate. If not applicable or not available, record "N/A", Any unusual conditions or construction practices that should be noted in the comments section, For large diked embankments, separate checklists may be used for different embankment areas. If separate forms are used, identify approximate area that the form applies to in comments.

	Yes	No		Yes	No
1. Frequency of Company's Dam Inspections?	**Monthly**		18. Sloughing or bulging on slopes?		X
2. Pool elevation (operator records)?	**928.2**		19. Major erosion or slope deterioration?		X
3. Decant inlet elevation (operator records)?	**N/A**		20. Decant Pipes		
4. Open channel spillway elevation (operator records)?	**930**		Is water entering inlet, but not exiting outlet?		X
5. Lowest dam crest elevation (operator records)?	**931.5**		Is water exiting outlet, but not entering inlet?		X
6. If instrumentation is present, are readings recorded (operator records)?	**N/A**		Is water exiting outlet flowing clear?		X
7. Is the embankment currently under construction?		**X**	21. Seepage (specify location, if seepage carries fines, and approximate seepage rate below):		
8. Foundation preparation (remove vegetation, stumps, topsoil in area where embankment fill will be placed)?	N/A		From underdrain?		X
9. Trees growing on embankment? (If so, indicate largest diameter below.)	**X**		At isolated points on embankment slopes?		X
10. Cracks or scarps on crest?		X	At natural hillside in the embankment area?		X
11. Is there significant settlement along the crest?		X	Over widespread areas?		X
12. Are decant trashracks clear and in place?	**N/A**		From downstream foundation area?		X
13. Depressions or sink holes in tailings surface or whirlpool in the pool area		X	"Boils" beneath stream or ponded water?		X
14. Clogged spillways, groin or diversion ditches?		X	Around the outside of the decant pipe?		X
15. Are spillway or ditch linings deteriorated?		X	22. Surface movements in valley bottom or on hillside?		X
16. Are outlets of decant or underdrains blocked?		X	23. Water against downstream toe?	X	
17. Cracks or scarps on slopes		X	24. Were Photos taken during the dam inspection?	X	

Major adverse changes in these items could cause instability and should be reported for further evaluation. Adverse conditions noted in these items should normally be described (extent, location, volume, etc.) in the space below and on the back of this sheet.

Inspection Issue #	Comments
3. Decant inlet elevation?	**3. The CCW slurry is piped into the pond and the solids separate from the water which is then pumped up to the Upper Pond. The open channel spillway and adjacent outlet works are used for controlled releases to the natural drainage consistent with the NPDES requirements.**
9. Trees growing on embankment?	**9. Trees up to 6 inches in diameter. Tree clearing was occurring during the inspection.**

23. Water against downstream toe?	**23. Plant and surrounding surface water collects along the north and east facing toes.**

Coal Combustion Waste (CCW)
Impoundment Inspection

Impoundment NPDES Permit # MO - 0095362 INSPECTOR: Brian Johnson/ GEI

Date 11 – 4 - 2010

Impoundment Name Lower Pond – Asbury Power Station

Impoundment Company **Empire District Electric Company**

EPA Region **8**

State Agency (Field Office) Address **1595 Wynkoop St**

Denver, CO 80202

Name of Impoundment Lower Pond
(Report each impoundment on a separate form under the same Impoundment NPDES Permit number)

New ______ Update ______

	Yes	No
Is impoundment currently under construction?		X
Is water or ccw currently being pumped into the impoundment?	X	

IMPOUNDMENT FUNCTION: Ash settlement and water decantation

Nearest Downstream Town: Name Asbury,MO
Distance from the impoundment **7 miles**

Impoundment Location:

Longitude	**94**	Degrees	**34**	Minutes	**54**	Seconds
Latitude	**37**	Degrees	**21**	Minutes	**38**	Seconds
State	MO	County	Jasper			

Does a state agency regulate this impoundment? YES X NO ______

If So Which Sate Agency? Missouri Department of Natural Resources (MDNR), Water Pollution Control

HAZARD POTENTIAL (In the event the impoundment should fail, the following would occur):

______ **LESS THAN LOW HAZARD POTENTIAL**: Failure or misoperation of the dam results in no probable loss of human life or economic or environmental losses.

______ **LOW HAZARD POTENTIAL:** Dams assigned the low hazard potential classification are those where failure or misoperation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.

__X___ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure.

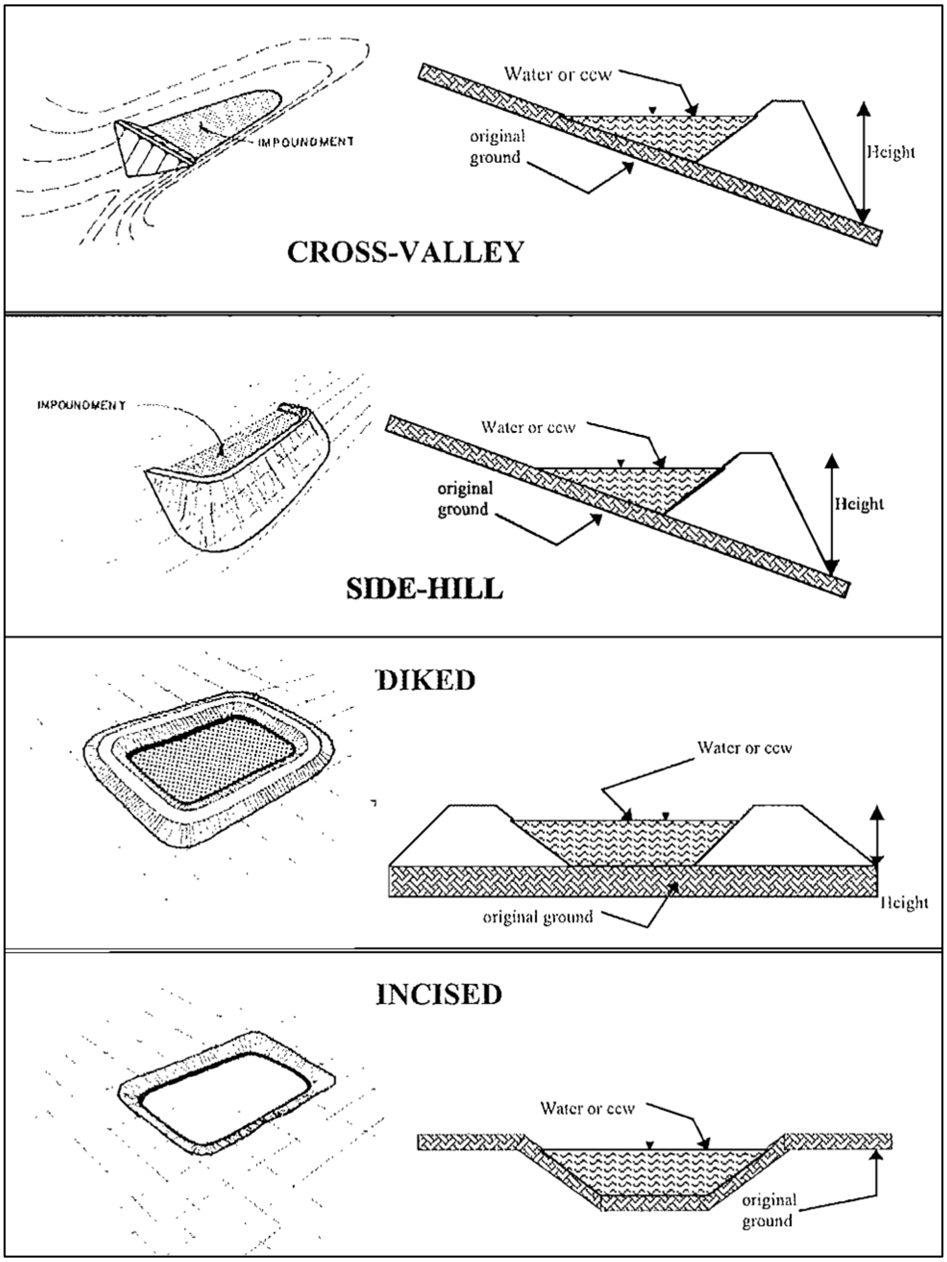
______ **HIGH HAZARD POTENTIAL:** Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

An uncontrolled release of the structure's contents due to a failure or misoperation is not considered to cause loss of human life, however, CCW would flow into the adjacent drainage and areas surrounding the pond.

Based on potential environmental impacts to property adjacent to the Owner's land the dam shpuld be classified as a "SIGNIFICANT" hazard structure which is consistent with Federal Guidelines for Dam Safety.

CONFIGURATION:

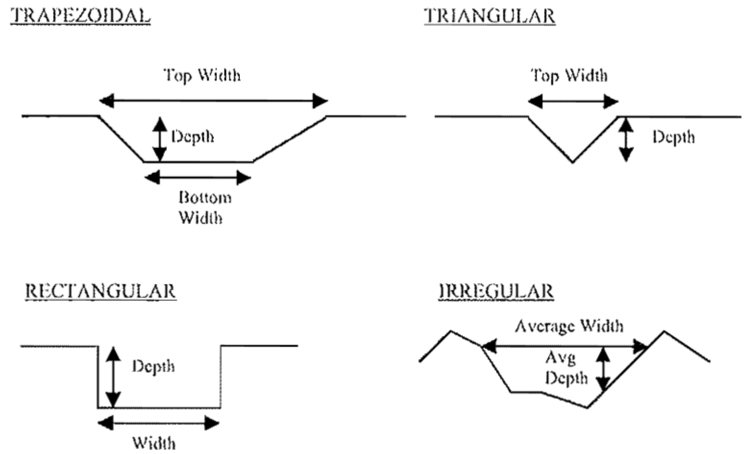


______ Cross-Valley
__X__ Side-Hill
______ Diked
______ Incised (form completion optional)
______ Combination Incised/Diked

Embankment Height __15.5__ feet   Embankment Material ____Clays____
Pool Area___63___ acres   Liner____N/A____
Current Freeboard __2__ feet   Liner Permeability__N/A____

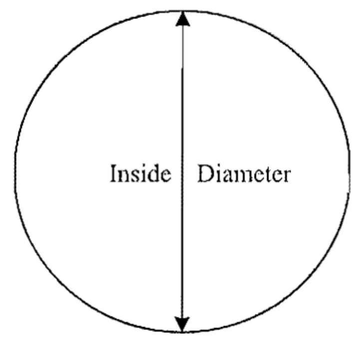
TYPE OF OUTLET (Mark all that apply)

__X__ **Open Channel Spillway**
__X__ Trapezoidal
______ Triangular
______ Triangular
1.5'__ Depth
_20'__ Bottom (or average) width
_26'__ Top width



__X__ **Outlet**

__12"__ inside diameter



Material
______ corrugated metal
______ welded steel
______ concrete
__X__ plastic (hdpe, pvc, etc.)
______ other (specify________________

Is water flowing through the outlet? YES______ NO__X__

______**No Outlet**

______ **Other Type of Outlet (Specify)** ________________________________

The Impoundment was Designed By ______________________________________

____

Has there ever been a failure at this site? YES ______ NO __X__

If So When?______________________________

If So Please Describe:

Has there ever been significant seepages at this site? YES __X__ NO_____

If So When? Prior to 1988

If So Please Describe:

Seepage was observed downstream of the southeast perimeter embankment and a clay cutoff was "keyed" into the underlying clay formation downstream of the original embankment crest. Seepage was discovered to be occurring through an abandoned outlet/decant pipe during the installation of the cutoff. The seep was stopped and has not recurred.

Has there ever been any measures undertaken to monitor/lower Phreatic water table levels based on past seepages or breaches at this site? YES ______ NO __X__

If So which method (e.g., piezometers, gw pumping, …)? ______________________

If So Please Describe:

Site Name: Asbury Power Station　　Date: 11- 4- 2010

Unit Name: South Pond　　Operator's Name: Empire District Electric Company

Unit ID: MO - 0095362　　Hazard Potential Classification: High **Significant** Low

Inspector's Name: **Brian Johnson/ GEI Consultants; Jim Wright/ GEI Consultants**

Check the appropriate box below, Provide comments when appropriate. If not applicable or not available, record "N/A", Any unusual conditions or construction practices that should be noted in the comments section, For large diked embankments, separate checklists may be used for different embankment areas. If separate forms are used, identify approximate area that the form applies to in comments.

	Yes	No		Yes	No
1. Frequency of Company's Dam Inspections?	**Monthly**		18. Sloughing or bulging on slopes?		X
2. Pool elevation (operator records)?	**951.5**		19. Major erosion or slope deterioration?		X
3. Decant inlet elevation (operator records)?	**N/A**		20. Decant Pipes		
4. Open channel spillway elevation (operator records)?	**N/A**		Is water entering inlet, but not exiting outlet?	N/A	
5. Lowest dam crest elevation (operator records)?	**953.5**		Is water exiting outlet, but not entering inlet?	N/A	
6. If instrumentation is present, are readings recorded (operator records)?	**N/A**		Is water exiting outlet flowing clear?	N/A	
7. Is the embankment currently under construction?		**X**	21. Seepage (specify location, if seepage carries fines, and approximate seepage rate below):		
8. Foundation preparation (remove vegetation, stumps, topsoil in area where embankment fill will be placed)?	N/A		From underdrain?		X
9. Trees growing on embankment? (If so, indicate largest diameter below.)	**X**		At isolated points on embankment slopes?		X
10. Cracks or scarps on crest?		X	At natural hillside in the embankment area?		X
11. Is there significant settlement along the crest?		X	Over widespread areas?		X
12. Are decant trashracks clear and in place?	**N/A**		From downstream foundation area?		X
13. Depressions or sink holes in tailings surface or whirlpool in the pool area		X	"Boils" beneath stream or ponded water?		X
14. Clogged spillways, groin or diversion ditches?	N/A		Around the outside of the decant pipe?		X
15. Are spillway or ditch linings deteriorated?	N/A		22. Surface movements in valley bottom or on hillside?		X
16. Are outlets of decant or underdrains blocked?		X	23. Water against downstream toe?		X
17. Cracks or scarps on slopes		X	24. Were Photos taken during the dam inspection?	X	

Major adverse changes in these items could cause instability and should be reported for further evaluation. Adverse conditions noted in these items should normally be described (extent, location, volume, etc.) in the space below and on the back of this sheet.

Inspection Issue #	Comments
3. Decant inlet elevation?	**3. The decant inlet is a slide gate that adjusts the water surface elevation from Upper Pond to South Pond.**
9. Trees growing on the embankment?	**9. Trees up to 6 inches in diameter. Tree clearing was occurring during the inspection.**

20. Decant pipes.	**20. Water is pumped out of the pond when needed. Water was not being moved through the slide gate from Upper Pond to South Pond during the inspection.**

Coal Combustion Waste (CCW) Impoundment Inspection

Impoundment NPDES Permit # MO-0095362 INSPECTOR: Brian Johnson/GEI

Date 11 – 4 – 2010

Impoundment Name South Pond – Asbury Power Station

Impoundment Company **Empire District Electric Company**

EPA Region **8**

State Agency (Field Office) Address **1595 Wynkoop St**

Denver, CO 80202

Name of Impoundment South Pond
(Report each impoundment on a separate form under the same Impoundment NPDES Permit number)

New ______ Update ______

	Yes	No
Is impoundment currently under construction?		X
Is water or ccw currently being pumped into the impoundment?		X

IMPOUNDMENT FUNCTION: Cooling water and plant re-use water

Nearest Downstream Town: Name Asbury, MO
Distance from the impoundment **7 miles**
Impoundment
Location:

Longitude	**94**	Degrees	**35**	Minutes	**12**	Seconds
Latitude	**37**	Degrees	**21**	Minutes	**28**	Seconds
State	MO	County	Jasper			

Does a state agency regulate this impoundment? YES X NO ______

If So Which Sate Agency? Missouri Department of Natural Resources (MDNR), Pollution Control Branch

HAZARD POTENTIAL (In the event the impoundment should fail, the following would occur):

______ **LESS THAN LOW HAZARD POTENTIAL**: Failure or misoperation of the dam results in no probable loss of human life or economic or environmental losses.

______ **LOW HAZARD POTENTIAL:** Dams assigned the low hazard potential classification are those where failure or misoperation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.

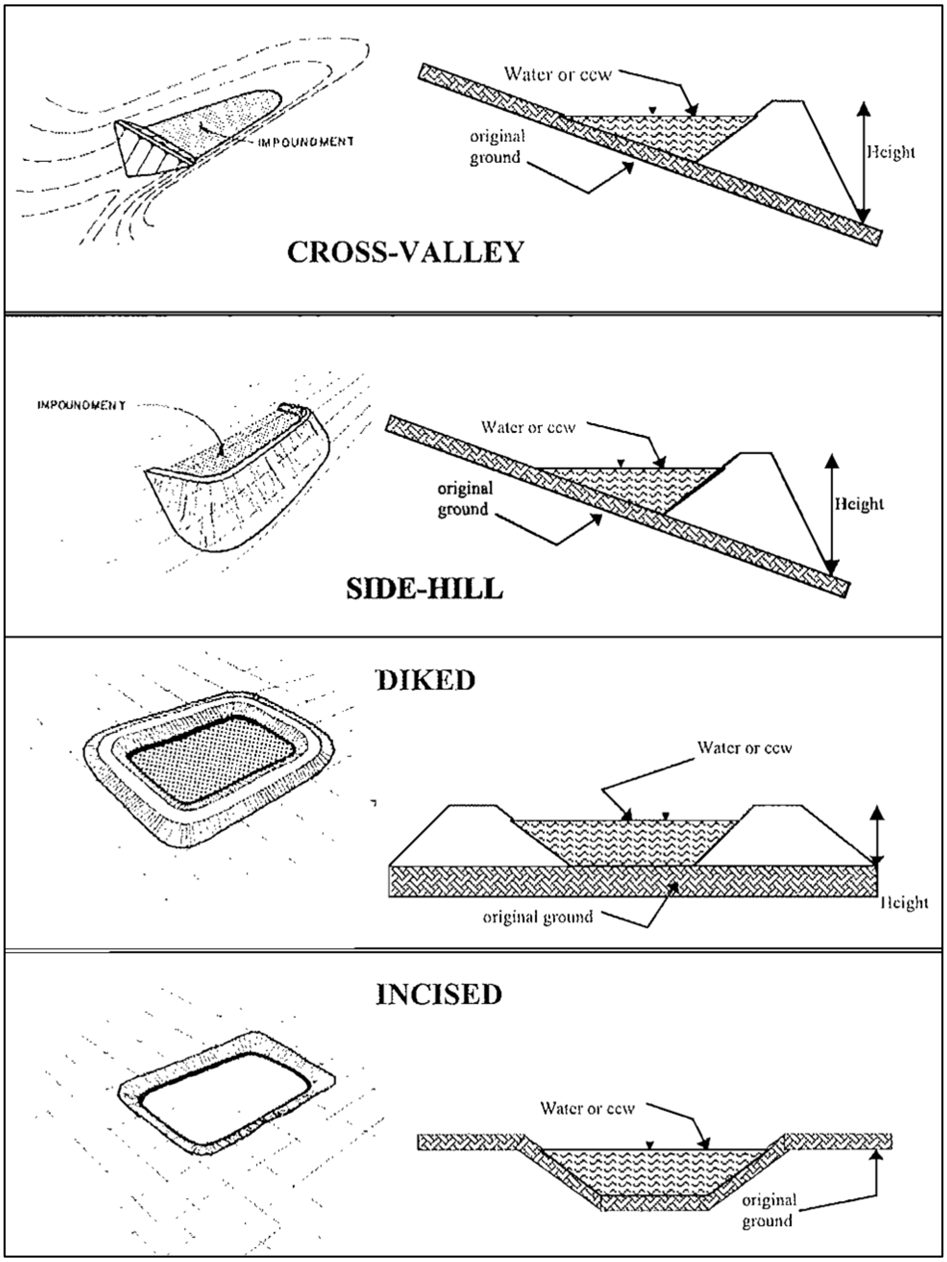
__X___ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure.

______ **HIGH HAZARD POTENTIAL:** Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

An uncontrolled release of the structure's contents due to a failure or misoperation is not considered to cause loss of human life, however, CCW would flow into the adjacent drainage and areas surrounding the pond.
Based on potential environmental impacts to property adjacent to the Owner's land, the dam should be classified as a "SIGNIFICANT" hazard
Structure which is consistent with Federal Guidelines for Dam Safety.

CONFIGURATION:



______ Cross-Valley

______ Side-Hill

_X___ Diked

______ Incised (form completion optional)

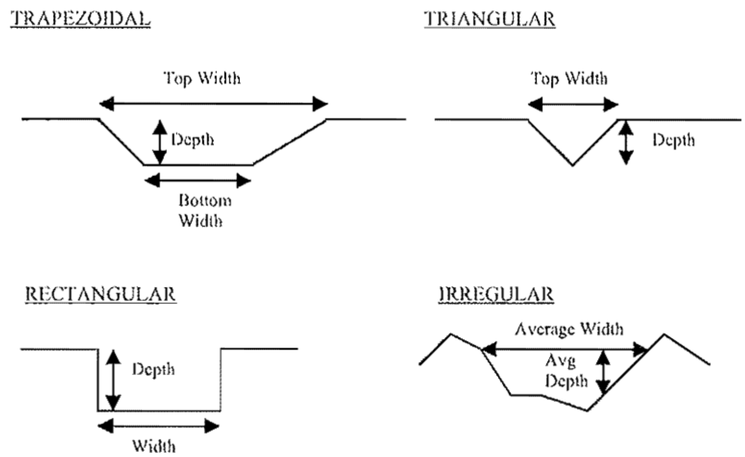
______ Combination Incised/Diked

Embankment Height __11.5_ feet   Embankment Material _____Clays______________

Pool Area____10.2________ acres   Liner_ **N/A** ______________________________

Current Freeboard __2___ feet   Liner Permeability__ **N/A** ____________________

TYPE OF OUTLET (Mark all that apply)

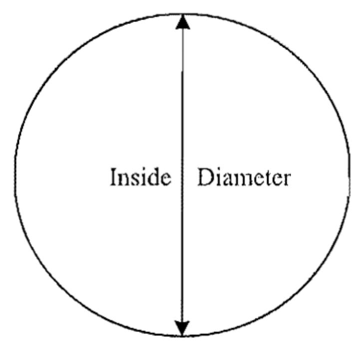


____N/A Open Channel Spillway
______ Trapezoidal
______ Triangular
______ Triangular

______ Depth
______ Bottom (or average) width
______ Top width

___N/A Outlet

______ inside diameter



Material
______ corrugated metal
______ welded steel
______ concrete
______ plastic (hdpe, pvc, etc.)
______ other (specify________________

Is water flowing through the outlet? YES______ NO__X__

______No Outlet

___X_ Other Type of Outlet (Specify) _Water is pumped out of the pond as needed.

The Impoundment was Designed By ____

____

Has there ever been a failure at this site? YES ______ NO __X__

If So When?____

If So Please Describe:

Has there ever been significant seepages at this site? YES ______ NO __X__

If So When? ______________________________

If So Please Describe:

Has there ever been any measures undertaken to monitor/lower Phreatic water table levels based on past seepages or breaches at this site? YES ______ NO __X__

If So which method (e.g., piezometers, gw pumping, …)? ______________________

If So Please Describe:

Appendix B

Inspection Photographs

Photo 1: Lower Pond crest and upstream slope at southwest corner of pond looking east.

Photo 2: Lower Pond downstream slope at southeast corner of pond looking west.

Photo 3: Lower Pond overflow spillway near southeast corner of pond.

Photo 4: Lower Pond V-notch weir next to overflow spillway.

Photo 5: Lower Pond upstream slope and crest at southeast corner looking north.

Photo 6: Lower Pond downstream slope at southeast corner of pond looking north. Note heavy tree growth at the downstream toe.

Photo 7: Lower Pond crest and interior perimeter ditch at northeast corner looking west.

Photo 8: Lower Pond downstream slope and exterior perimeter ditch (at right) at northeast corner looking west.

Photo 9: Lower Pond downstream slope at northwest corner of pond looking east.

Photo 10: Lower Pond crest and interior perimeter ditch at northwest corner of pond looking east. Note ash pile built up to the right the ditch.

Photo 11: Upper Pond crest and upstream vegetation at southeast corner of pond looking north.

Photo 12: Upper Pond downstream slope and tree growth at southeast corner of pond looking north.

Photo 13: Upper Pond overflow drop inlet and outlet valve.

Photo 14: Upper Pond crest looking east at the Lower Pond, Upper Pond outlet discharge point (in Photo 13), and pump house (middle of photo behind trees).

Photo 15: Upper Pond discharge flow from Lower Pond pumphouse.

Photo 16: Upper Pond crest and upstream slope at northeast corner of pond looking west.

Photo 17: Upper Pond downstream slope at northeast corner looking west.

Photo 18: Upper Pond coal pile sump at northwest corner. Note sump discharge pipes aligned into Upper Pond.

Photo 19: Railroad grade along north side of Upper and Lower Ponds.

Photo 20: Upper Pond upstream and crest at northwest corner looking south. Note tree growth on downstream slope.

Photo 21: Upper Pond downstream slope at northwest corner looking south.

Photo 22: Upper Pond downstream slope where CCW discharge pipes (note arrows) cross through and continue to the Lower Pond.

Photo 23: Upper Pond crest and downstream slope at inside corner looking north.

Photo 24: Upper Pond crest and downstream slope at inside corner looking west. Note heavy vegetation on upstream slope.

Photo 25: South Pond upstream slope and crest at southwest corner of pond looking east.

Photo 26: South Pond downstream slope at southwest corner looking east. Note heavy vegetation on downstream slope and standing water in excavated borrow area.

Photo 27: South Pond west section crest adjacent to Cooling Water Reservoir (on left).

Photo 28: South Pond crest and downstream slope at northeast corner of pond looking south. Note heavy vegetation on upstream and downstream slopes.

Appendix C

Reply to Request for Information under Section 104(e)

SERVICES YOU COUNT ON

William L. Gipson
President and Chief Executive Officer

March 25, 2009

Mr. Richard Kinch
US Environmental Protection Agency (5306P)
1200 Pennsylvania Ave., NW
Washington, DC 20460

RE: Request for Information Under Section 104 (e) of the Comprehensive Environmental Response, Compensation, and Liability Act U.S.C. 9604 (e)

Mr. Kinch:

The Empire District Electric Company acknowledges receipt of the US Environmental Protection Agency Request for Information, received at the Asbury Power Station and our corporate office on March 13, 2009. Included with this letter is the requested response to your questionnaire. Additionally, one coal combustion facility owned and managed by our corporation did not receive an information request. This facility is identified in a separate list provided as an Enclosure.

If we can be of further assistance in providing additional information about our facilities, please contact George Thullesen, Director of Safety and Environmental Services, at 417-625-5123.

I certify that the information contained in this response to EPA's request for information and the accompanying documents is true, accurate, and complete. As to the identified portions of this response for which I cannot personally verify their accuracy, I certify under penalty of law that this response and all attachments were prepared in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, those persons directly responsible for gathering information, the information submitted is, to the best of my knowledge, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

Signature: William L. Gipson

Name: William L. Gipson

Title: President & CEO

pas
Enclosures

The Empire District Electric Company

Enclosure: List of facilities in The Empire District Electric Company which have not received an Information Request.

Riverton Power Station – 7240 SE HWY 66 – Riverton, Kansas 66770

Enclosure

Response to Information Request: EPA letter dated March 9, 2009

Asbury Power Station

1. Relative to the National Inventory of Dams criteria for High, Significant, Low, or Less-than-Low, please provide the potential hazard rating for each management unit and indicate who established the rating, what the basis of the rating is, and what federal or state agency regulates the unit(s). If the unit(s) does not have a rating, please note that fact.

The Asbury ash impoundment unit does not have an established rating relative to the National Inventory of Dams criteria. The unit is regulated by the Missouri Department of Natural Resources, Water Pollution Control Branch.

2. What year was each management unit commissioned and expanded?

The Asbury ash impoundment as operated and managed today was constructed in three separate phases. The original impoundment was built in 1970, a lower pond expansion was constructed in 1974 and an upper pond was added to the containment area in 1978.

3. What materials are temporarily or permanently contained in the unit? Use the following categories to respond to this question: (1) fly ash; (2) bottom ash; (3) boiler slag; (4) flue gas emission control residuals; (5) other. If the management unit contains more than one type of material, please identify all that apply. Also, if you identify "other," please specify the other types of materials that are temporarily or permanently contained in the unit(s).

The Asbury Power Station is a Cyclone type unit. As operated, only fly ash and boiler slag are permanently contained in the impoundment area. The current extraction of boiler slag for beneficial use is at a pace that its storage time is greatly reduced.

4. Was the management unit(s) designed by a Professional Engineer? Is or was the construction of the waste management unit(s) under the supervision of a Professional Engineer? Is inspection and monitoring or the safety of the waste management unit(s) under the supervision of a Professional Engineer?

The original and supplemental additions of the Asbury ash impoundment area was not designed or constructed under the supervision of a professional Engineer. The inspection, monitoring and safety of the ash impoundment area are performed by plant staff.

5. When did the company last assess or evaluate the safety (i.e., structural integrity) of the management unit(s)? Briefly describe the credentials of those conducting the structural integrity assessments/evaluations. Identify actions taken or planned by facility personnel as a result of these assessments or evaluations. If corrective actions were taken, briefly describe the credentials of those performing the corrective actions, whether they were company employees or contractors. If the company plans an assessment or evaluation in the future, when is it expected to occur?

In April 1987, The Empire District Electric Company (Empire) contracted with Black and Veatch Engineering – Architects of Kansas City, Missouri for an Ash Pond Improvement Study at the Asbury Power Station (B&V Project 13611). Black and Veatch Engineers assessed the impoundment area and developed a project plan from the results of its site investigation and laboratory testing. Under the supervision of Black and Veatch Engineers, contractors built an impermeable barrier in the primary holding cell keyed into the underlying bedrock. Additional remedial actions included repairing erosion damage to the crest, restoring the structural integrity of the dike, and enhancement of erosion resistance to the upstream slope.

6. When did a State or a Federal regulatory official last inspect or evaluate the safety (structural integrity) of the management unit(s)? If you are aware of a planned state of federal inspection or evaluation in the future, when is it expected to occur? Please identify the Federal or State regulatory agency or department which conducted or is planning the inspection or evaluation. Please provide a copy of the most recent official inspection report or evaluation.

The Asbury Power Station was last inspected on February 9, 2006, by the Missouri Department of Natural Resources (MDNR). The inspection focused on the cooling water, storm water, and wastewater facilities operating under Missouri State Operating Permit MO-0095362. The ash impoundment overflow discharge point is a permitted outfall. No specific comments relative to the safety or structural integrity of the ash pond were noted in the report. A copy of the report is attached. The Empire District Electric Company is not aware of any planned State or Federal inspections. The current inspection schedule used by the MDNR is not announced.

7. Have assessments or evaluations, or inspections conducted by State or Federal regulatory officials conducted within the past year uncovered a safety issue(s) with the management unit(s), and if so describe the actions that have been or are being taken to deal with the issue or issues. Please provide any documentation that you have for these actions.

To the best of Empire's knowledge no assessments, evaluations or inspections have been conducted by State or Federal regulatory officials within the last year at the Asbury Power Station regarding the ash impoundment unit.

8. What is the surface area (acres) and total storage capacity of each of the management units? What is the volume of materials currently stored in each of the management unit(s)? Please provide the maximum height of the management unit(s). The basis for determining maximum height is explained later in this Enclosure.

The Asbury ash impoundment unit covers approximately 92 acres of surface area. The total storage capacity is not known but is estimated to be in the range of 20 years at current production rates. Since the start of plant operations an estimated 1,045,000 tons of fly ash has been disposed in the impoundment. The maximum total height of the unit is 26 feet.

9. Please provide a brief history of known spills or un-permitted releases from the unit within the last ten years, whether or not these were reported to State or Federal regulatory agencies. For purposes of this question, please include only releases to surface water or to the land (do not include releases to groundwater).

No un-permitted release or spills have occurred within the past ten years. The ash impoundment contains an overflow outfall that is allowed to periodically discharge under final effluent limitations and monitoring requirements specified in the operating permit.

10. Please identify all current legal owners(s) and operator(s) at the facility.

The legal owner and operator of the Asbury Power Station is The Empire District Electric Company.